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Computer programs for v.h.f. interference prediction using a terrain data bank

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THE BRITISH BROADCASTING CORPORATION
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Summary

A set of computer programs has been written to aid broadcast service planning work in the v.h.f. bands. They are intended for f.m. sound in Band II as well as new television and other possible services in Bands I and III. The prime object is the prediction of interference levels from other transmitters into a service area. The methods are an extension of those employed for u.h.f. where terrain and transmitter data banks are used. This report gives an outline of these methods, especially where they differ from the previously described u.h.f. programs.

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1. Introduction

For many years the BBC has found field-strength calculation by computer an essential aid to the planning of the u.h.f. services.[1,2] The necessity to add further services into the Band II spectrum and the probability that Bands I and III will be re-planned for 625-line television and other possible broadcast services means there is a need for equivalent computer programs for v.h.f. This report gives some details of the way the u.h.f. computer programs have been extended for 'interference' predictions at v.h.f. using terrain data banks. In this report the word 'interference' refers to unwanted signals which have a frequency sufficiently close to the wanted frequency to produce a recognizable deterioration in the received signal.

The principal changes to the existing u.h.f. programs are listed below.

(i) The main programs were re-organized to satisfy the requirements of planning engineers for the v.h.f. bands.

(ii) The sub-programs were re-organized to keep as many of them as possible common to both u.h.f. and v.h.f.

(iii) New transmitter data banks with a different form had to be established.

(iv) The propagation mechanisms have a different emphasis and hence the field-strength calculations had to be modified.

(v) The requirement to re-plan Bands I and III meant that it was necessary to deal with a complicated protection-ratio situation. Similarly, allowance was made for protection ratios for f.m. sound services in Band II.

The parts of the system for u.h.f. prediction which produce a terrain profile are, of course, independent of the frequency band and thus v.h.f. requirements did not directly impose modifications. However, some changes have been made to the original u.h.f. system to make it more efficient.

2. Computer program organization

To minimize the amount of program storage and to produce a more organized system, the u.h.f. programs described in Reference 1 were re-arranged such that those processes also needed for v.h.f. are in common sub-routines. The programs are now stored in seven files in the magnetic drum system of a large computer. They are organized thus:

(i) Calculation routines exclusive to:
  (a) u.h.f.
  (b) Band II
  (c) Bands I and III
  These three files have equivalent, but not identical, sets of elements.

(ii) Transmitter data handling routines for (a), (b) and (c) above.

(iii) Routines for common usage.

While several versions of the programs exist (see Section 7) in order to aid the planning engineer in various ways, the central aim is to calculate the protected field-strength (PFS)* determined by an interfering transmitter or a set of interfering transmitters, at locations in the service area of a specified 'wanted' transmitter. PFS is that field which must be provided by the wanted station to overcome the interference from unwanted sources. For a single interfering source it is the sum of the field-strength (F)* of the interfering source, the receiving-aerial protection (AP)* and a protection ratio (PR)* all expressed in decibels. The protection ratio is the ratio of the wanted to interfering signal for satisfactory reception, and depends on the frequency offset and other characteristics of the two transmissions. Although this central task is common to the u.h.f. and v.h.f. programs, many other differences between the requirements for the bands, such as transmitter data, output and protection ratios make it necessary to have separate programs to calculate PFS values. A flow-chart of the task is given in Fig. 1. Details of the various operations involved in computing PFS for u.h.f. can be found in References 1, 2 and 3. Most of these operations are applicable to v.h.f., but some require changes, and these are described in the following sections.

3. The transmitter data bank

The transmitter data bank for Bands I, II and III consist of eight randomly accessible magnetic-drum data files, accessed with standard Fortran read/write instructions. The file structure is based on the u.h.f. system described in Reference 1, and consists of the following.

1. A frequency register for Bands I and III contains lists of vision and sound frequencies and reference numbers for all Band I and III stations, in the order in which their data is stored in the station files.

2. A frequency register for Band II contains the reference numbers for all stations on each frequency, and a directory

---

* The symbols PFS, F, AP and PR are the variable names used in the computer to represent the quantities as stated.

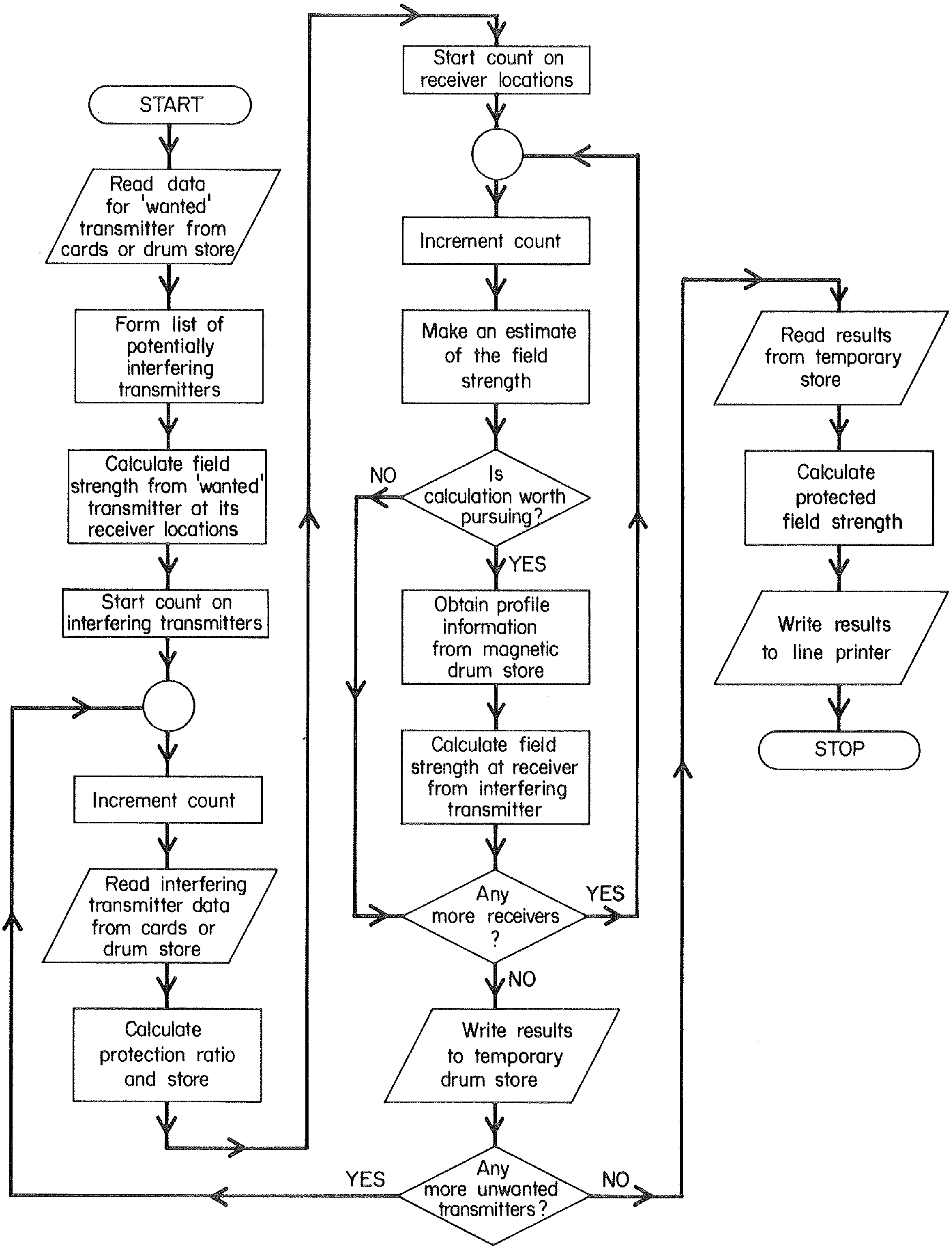

START
Read data for 'wanted' transmitter from cards or drum store
Form list of potentially interfering transmitters
Calculate field strength from 'wanted' transmitter at its receiver locations
Start count on interfering transmitters
Increment count
Read interfering transmitter data from cards or drum store
Calculate protection ratio and store
Start count on receiver locations
Increment count
Make an estimate of the field strength
Is calculation worth pursuing?
NO
YES
Obtain profile information from magnetic drum store
Calculate field strength at receiver from interfering transmitter
Any more receivers ?
YES
NO
Write results to temporary drum store
Any more unwanted transmitters?
YES
NO
Read results from temporary store
Calculate protected field strength
Write results to line printer
STOP

Fig. 1 - Simplified flowchart of the interference calculation

TABLE 1

Transmitter and Test Point Data

Item	Type	No. of words		Notes
		Band I/III	Band II	
Transmitter number	I	1	1	
Date of data input	A	1	1	
Name and site responsibility	A	3	3	
Program status	A	1	1	Also contains precision offset code for Bands I, III
Transmitter n.g.r.	–	1	1	2 letter, 6 figure n.g.r. packed into one word*
Latitude	F	1	1	In degrees with decimal fractions
Longitude	F	1	1	
Polarization, colour system (PAL, SECAM, monochrome) and channels	A	1	–	Six characters packed into one word
Polarization and data issue number	–	–	1	The number and character (for polarization) are packed into one word
Television standard and e.r.p. code (omni/directional)	A	1	–	One character for standard and one for e.r.p. code
Sound frequencies (kHz)	I	–	4	One for each of 4 programmes for Band II
Vision frequencies (kHz)	F	2	–	For each of 2 programmes for Bands I/III
Sound frequencies (kHz)	F	2	–	
Prog. source and receiver aerial height	–	–	4	For 4 programmes (for Bands I/III, see below)
Site height (ft. a.o.d.)	I	1	1	
Transmitter aerial height (ft. a.g.l.)	–	1	2	Heights for each Band II frequency packed 2 to a word
Max. e.r.p. (kW)	F	1	1	
HRP (dB below max.) at 10° intervals	A	6	24	For each programme (common for Bands I/III). Coded figure for six directions packed into each word.
Number of receivers	–	1	1	No. of domestic receivers, and no. of r.b.l.s packed into a word
Receiver information (Band II)	–	–	60	Transmitter no. for r.b.l.s, receiver n.g.r. for domestics
Domestic receiver information (Bands I/III)	–	24	–	Receiver n.g.r.
RBL information (Bands I/III)	–	2 x 5	–	n.g.r. and aerial height for each r.b.l.

I: integer F: floating point A: character format

* There are 36 bits per word. Each character occupies 6 bits.

of the UK and Continental stations on the Band II station files.

3–5. The UK Bands I, II and III station files contain site, aerial and receiver location information, detailed in Table 1.

6–8. The Continental Bands I, II and III station files are similar to the UK files, but include no receiver information.

There is a separate set of programs for up-dating and listing these files.

4. Field-strength prediction

Some of the problems of accurate prediction of field strengths are the following:

(i) Theoretical calculations are difficult for other than simple geometric structures which are rarely found in practice.

(ii) The cost of obtaining a very detailed profile is large.

(iii) To allow for signals arriving via other paths besides those in the vertical plane between terminals is not practicable and errors may arise on this count.

(iv) Detailed knowledge of the atmospheric states is lacking.

Because of these problems we do not profess to make a calculation for a particular point in space but for a field representative of that to be found in an area. In the case of interference predictions this area is said to be a half kilometre square. Although this is a restriction in one respect, in another it is an advantage. This is because when considering the domestic receiver it is not possible to make a calculation for all possible cases. It is only necessary to produce representative results for the purposes of planning.

The first part of the calculation is to obtain a free-space value and then a loss, L in decibels, is calculated based on the formula

$$L = \mathrm{MIN}\left\{S - a(S - K),\ \mathrm{MAX}(b + cT,\ d + eT)\right\} + \mathrm{MIN}(fU,\ g) \qquad (1)$$

where S and K are diffraction loss values (in dB) relative to free-space calculated by stylising the profile into a suitable surface (wedge, cylinder or sphere) and a set of knife-edges respectively. T is a parameter to allow for fields enhanced by tropospheric irregularities; it is $\log_{10}$ of the angle in milliradians between the horizon line from the transmitter and the one from the receiver. U is a measure of the amount of urban clutter and trees obstructing the reception. The numbers a – g are weighting factors determined by producing a minimum difference between the prediction and measurements. Further details on the calculation of the quantities mentioned above may be found in Reference 1. The numbers a – g determined for v.h.f. prediction can differ from those determined for u.h.f.

The fields calculated are those which will be exceeded for 50, 5 and 1 percent of time. The time variations are obtained by assuming a varying Earth's curvature and some weighting factors are allowed to be functions of time percentage. The main values used are set out in Table 2. One important exception occurs when both terminals have sea horizons, and there is no land between these horizons; a spherical surface calculation is then made and 'a' is zero. Further details of the methods can also be found in References 1, 2 and 3.

TABLE 2

V.H.F. Weighting Factors

Time %	Earth's curvature multipliers	Weighting factors						
		a	b	c	d	e	f	g
50	1·33	0·519	5·3	37	32	10	16	8
5	2·2	0·519	–1	37	24·1	10	16	8
1	4·5	0·519	–1	37	21·8	10	16	8

There were 417 measurements used in the process of obtaining the weighting factors; 331 of these were for shorter distances and 50% time calculations and 86 were used for the longer distances and all time percentages. The r.m.s. of the differences between the calculations and measurements are 7·5 dB for 50% time, 5·54 dB for 5% time and 6·75 dB for 1% time.

5. Protection ratios

The interference which limits a television service may be from and to either a vision carrier, a sound carrier or a colour subcarrier. The term protection ratio is used here to mean a ratio (in dB), of the impaired carrier to the particular interfering carrier which is necessary to ensure that the interference is tolerable. The measure of interference level finally deduced, as indicated in Section 2, is called the protected field-strength, which is the wanted vision carrier field-strength required at a receiver to make interference tolerable.

The computer programs are required in particular for the work of planning the change-over of the present standards of television in N.W. Europe (e.g. 405-lines in UK) to a 625-line system, this work being referred to as re-engineering. For this it is not only necessary to know the interference situation on the re-engineered system but to know the existing values and that at any intermediate stage: the new system will be gradually established over a period of years. It is, therefore, necessary to be able to compute the protection ratio from any one television system to any other. The authority for the values of protection ratio to be applied is the CCIR.[4,5] However, in certain cases there are gaps or ambiguities in the value to be applied and here it was necessary to obtain values by other means. The fact that so many combinations may exist means that the calculation of protection ratios represents a major part of the computer work in the calculation of interference.

The programs contain a set of curves, for vision-on-vision, vision-on-sound and sound-on-vision protection ratios, for each of the television standards A, B, C, E, F, I and L.[6] It also contains sound-on-sound curves for a.m. and f.m. sound. The chosen protection ratio figure is the maximum of the figures for the four 'carrier pairs'.

The CCIR curves are adapted in the following way in the case of television.

1. Offset conditions

   If Δ is the fractional part of the difference between carriers as a multiple of line frequency of the wanted transmitter, then the offset condition is determined by

$0 \leqslant \Delta \leqslant 0{\cdot}2$	No offset
$0{\cdot}2 < \Delta \leqslant 0{\cdot}4$	$\frac{1}{3}$ line
$0{\cdot}4 < \Delta < 0{\cdot}6$	½ line
$0{\cdot}6 \leqslant \Delta < 0{\cdot}8$	$\frac{1}{3}$ line
$0{\cdot}8 \leqslant \Delta \leqslant 1{\cdot}0$	No offset

   If no $\frac{1}{3}$ line curve is given, the $\frac{1}{2}$ line curve is applied to that condition.

   Allowance is also made for precision offsets. Thus if the vision carriers of both wanted and interfering transmitters are designated as 'precision' the protection ratio is reduced by 12 dB if they are in the no offset state and by 6 dB if they are in the $\frac{1}{3}$ line state.*

2. Sound-on-sound protection

   Sound-on-sound interference is not considered if the carriers are separated by more than 50 kHz. Otherwise the protection ratio is calculated as in Reference 4.

3. Sound/vision power ratios

   If the interference is to or from a sound carrier, then in order to calculate the protected field-strength from the protection ratio, it is necessary to know the ratio of the powers of the sound and vision carriers of each transmission.

In the case of Band II protection ratios are taken from the CCIR.[7] Both mono and stereo is allowed for within the programs.

6. Receiving aerial protection

The aerial protection assumed to exist for the domestic reception of Bands I and III is shown in Fig. 2(*a*). The protection used for a re-broadcast receiver is shown in Fig. 2(*b*).

The equivalent protections for Band II are shown in Figs. 3(*a*) and 3(*b*). It will be seen that in this case it was also necessary to allow for slant polarization. The domestic receiver discrimination shown applies to stereo reception; for dealing with mono reception aerial discrimination is omitted.

In Figs. 2(*a*) and 3(*a*) values for the same polarization are based on a CCIR Recommendation.[8] Those for cross-polarized and slant-polarized interference, and all values for links, are based on information available in the Department.

7. Program versions and outputs

There are six operating versions available. Version 1 predicts the field from one transmitter to one receiver assuming the e.r.p. is 1 kW. The output gives a detailed breakdown of the different types of loss found in Equation (1). Version 2 calculates the wanted field strengths along radial lines from a transmitter. Although Versions 1 and 2 do not predict interference levels as such, they call subroutines common to all the v.h.f. programs.

Version 3 tests the effects of adding a new transmitter to an existing network. These effects can be put into two categories:

(a) the interference that the new transmitter will cause to the service from existing stations

(b) the interference that existing stations will cause to its service area.

It is also possible to select two stations and to predict the interference from one to the other. Version 3 performs the essential interference calculation, as shown in the simplified flow chart of Fig. 1. An input code determines whether the program calculates the interference to or from the specified station.

Figs. 4 and 5 give examples of the output of the calculation of interference to the specified station. The output shown in Fig. 4 is for Bands I and III only and consists of a list of all stations selected as interfering sources, together with transmitter information and the protection ratio. The column headed 'system' gives one of the television standards A, B, C, E, F, I and L, which are described in Ref. 6. The characters used to describe the channels for the various systems are taken from Ref. 9. An asterisk after the channel denotes that the transmitter is using precision offset. The characters printed under the heading 'type of interf' describe which carrier of the interfering station gives the dominant interference, and with which carrier of the wanted station it interferes. For example, 'SV' means that the sound carrier of the interfering station is the dominant interference, and that it interferes with the vision carrier of the wanted station. An 'A' in the 'status' column means that the transmitter is in operation, whilst a 'D' means that it is envisaged.

Figs. 5(*a*) and 5(*b*) show the field-strengths and protected field-strengths at each location in the service area of the specified transmitter from each interfering source, together with receiver and geographical information. To save printed output, sources are excluded if they give interference below a certain level.

Figs. 6(*a*) and 6(*b*) give examples of the output of the calculation of interference from the specified station.

---

* These values were based on the best information that was available when the program was written. They may be revised in the future.

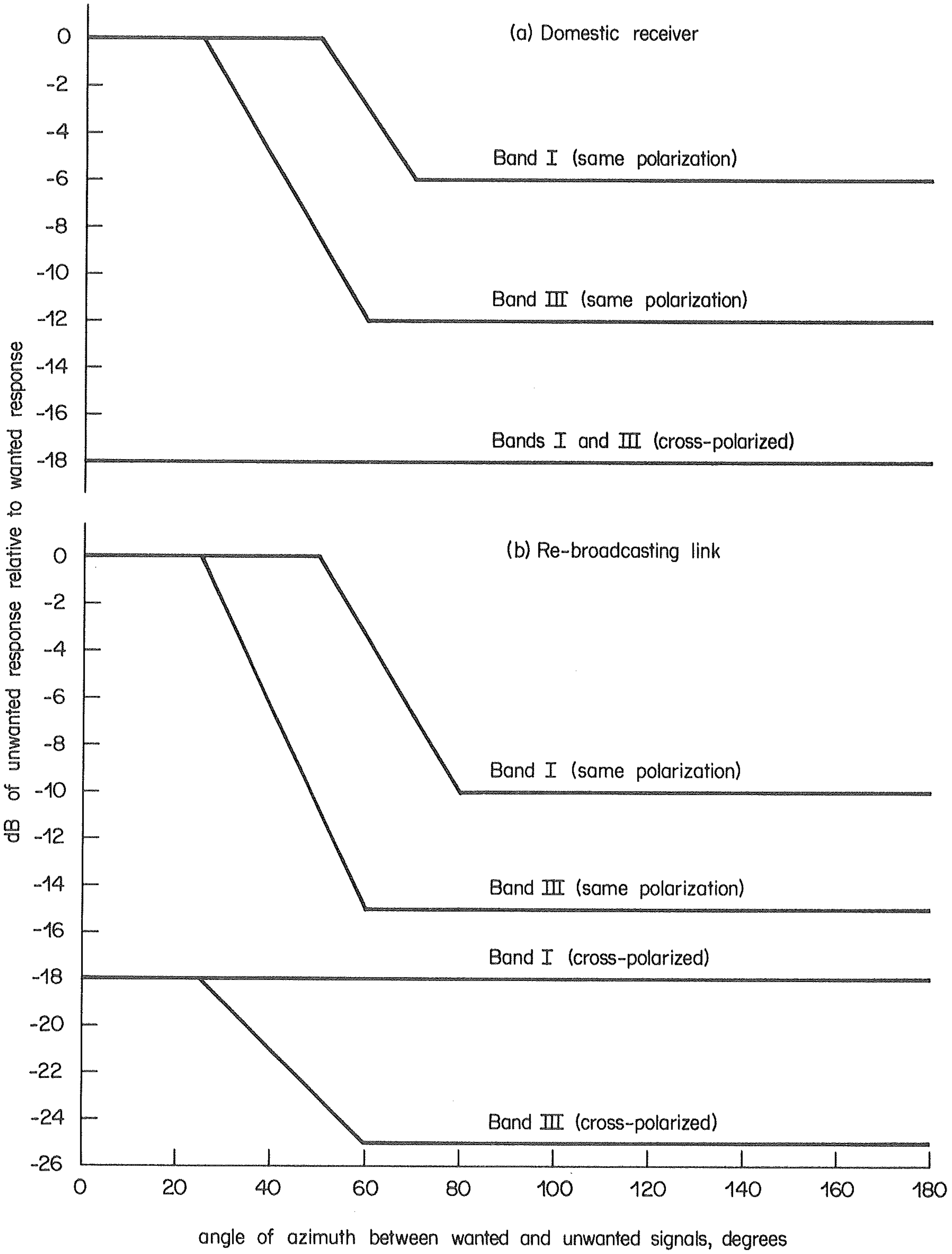


Fig. 2 - Stylized receiving aerial discrimination (Bands I and III)
(*a*) Domestic receiver (*b*) Re-broadcast link

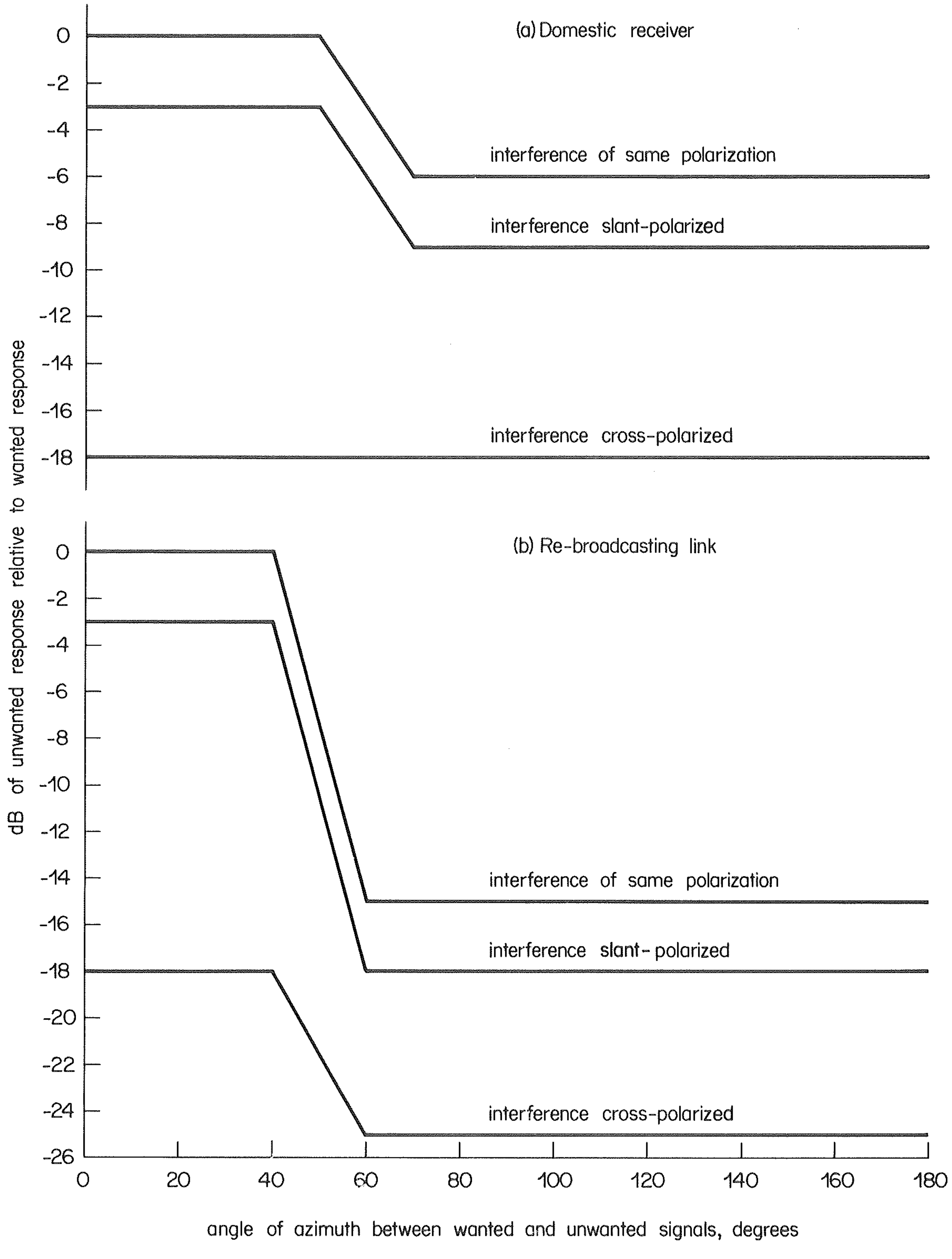
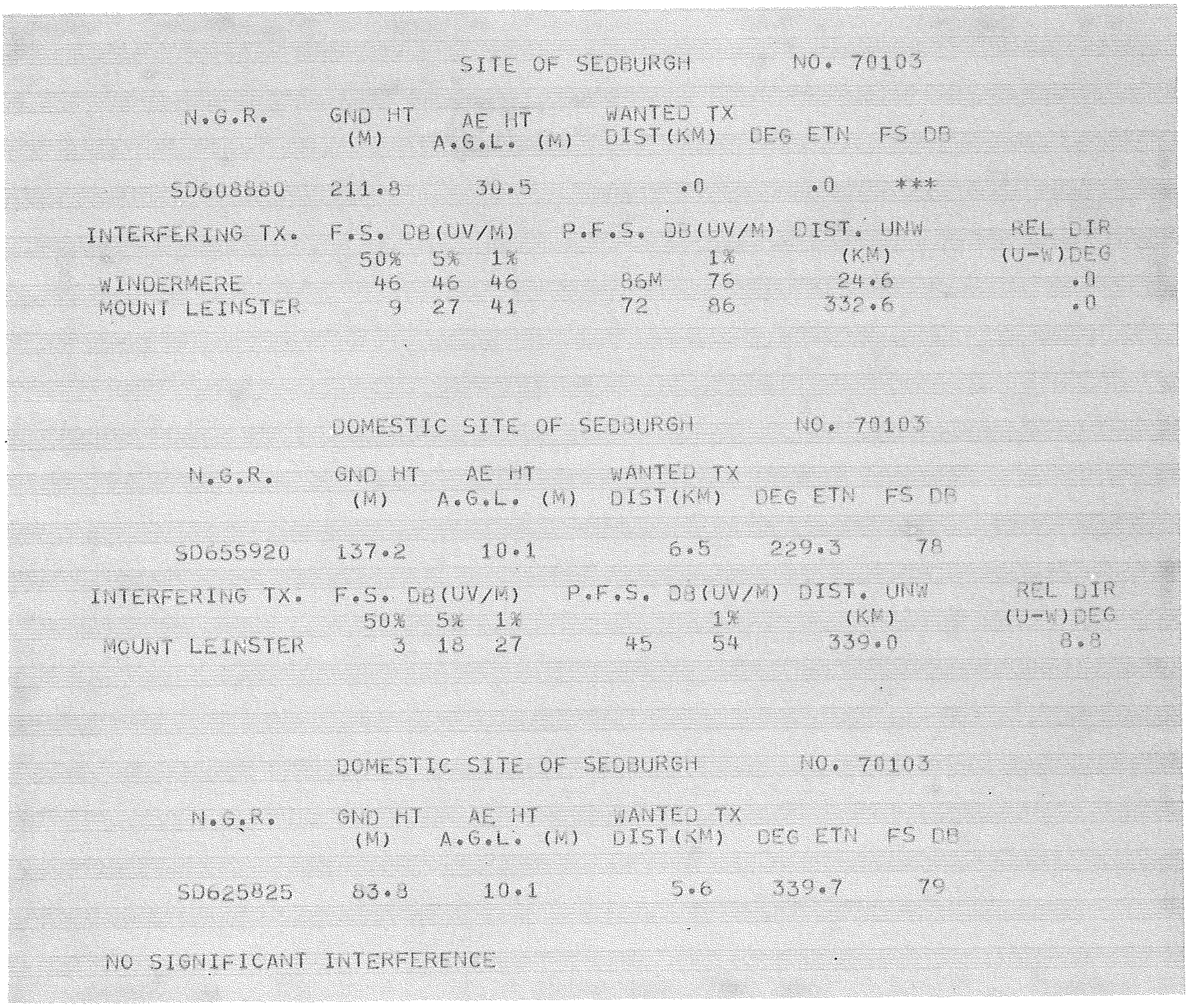


Fig. 3 - Stylized receiving aerial discrimination (Band II)

(*a*) Domestic receiver (*b*) Re-broadcasting link

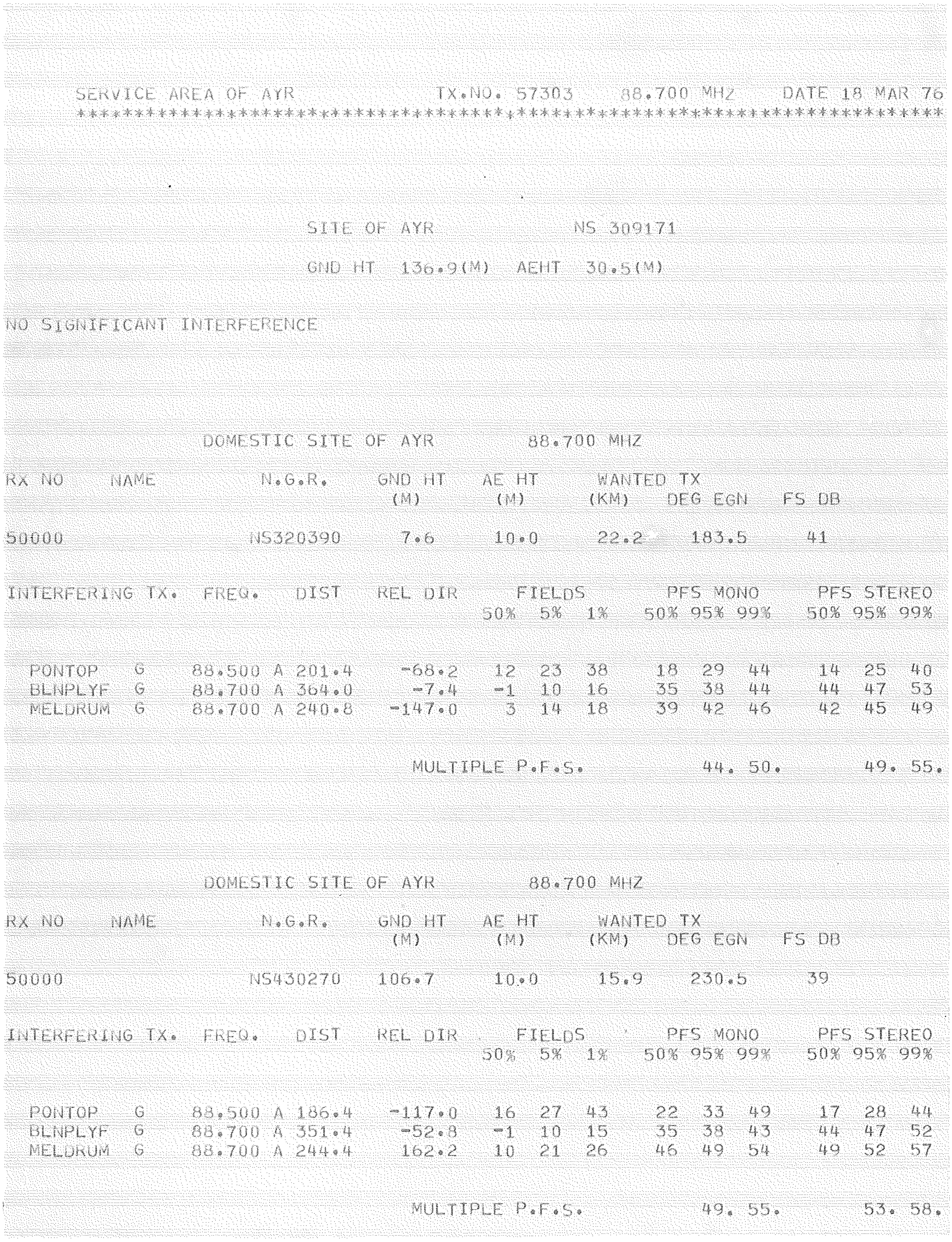
```
                 CO-CHANNEL INTERFERENCE PREDICTION FOR STATION 70103         20 SEP 77
                 *******************************************************************

                 SEDBURGH        SD608880 H I  F  191224.0 197224.0   1.0KW  D    220977

INTERFERING SOURCES

TX NO      NAME          POL SYSTEM CHANNEL    VISION     SOUND     TYPE OF  RELATIVE    PROT.  STATUS  ENTRY
                                                FREQ.      FREQ.    INTERF.   OFFSET     RATIO           DATE
                                                 KHZ        KHZ                KHZ
70101 WINDERMERE          V    I      F       191276.0  197276.0     VV          52.0     30.5     D    220977
70204 WHITEHAVEN B        H    I      F       191224.0  197224.0     VV            .0     45.0     D    200977
70302 KIRKCUDBRIGHT       V    I      F       191224.0  197224.0     VV            .0     45.0     D    220977
70500 BLACK MOUNTAIN      V    I      F *     191276.0  197276.0     VV          52.0     30.5     D    200977
70900 WH GTRMNCHSTR       H    I      F *     191250.0  197250.0     VV          26.0     30.3     D    200977
71504 BETWS Y COED        H    I      F       191224.0  197224.0     VV            .0     45.0     D    220977
71505 BALA                V    I      E       183224.0  189224.0     SV       -2000.0      1.0     D    220977
72100 KIPPURE             H    I      E *     183224.0  189224.0     SV       -2000.0      1.0          200977
72101 MOUNT LEINSTER      V    I      F *     191224.0  197224.0     VV            .0     45.0     D    200977
72102 TRUSKMORE           H    I      F *     191250.0  197250.0     VV          26.0     30.3     D    200977
80301 AALEN               V    B     08       196255.2  201755.2     VC        5031.2     39.5     A    060977
80306 FELDBERG            H    B     08       196255.2  201755.2     VC        5031.2     39.5     A    060977
80307 GROSSER             H    B     08       196260.4  201760.4     VC        5036.4     29.3     A    060977
80313 HEIDELBERG          V    B     07       189252.6  194752.6     SC        3528.6     29.5     A    060977
80314 HOHNER MEISS        H    B      7       189239.6  194739.6     SC        3515.6     29.2     A    060977
80317 KOBLENZ             H    B      6       196260.4  201760.4     VC        5036.4     29.3     A    060977
80322 IBBENBUEREN         H    B      8       196296.9  201796.9     VC        5072.9     28.5     A    060977
80330 MARLOW              H    B      8       196251.3  201751.3     VC        5027.3     29.5     A    060977
81001 MARKELO             H    B      7       189250.0  194750.0     SC        3526.0     29.4     A    060977
81102 WAVRE               H    C      8       196250.0  201750.0     VC        5026.0     29.5     A    060977
81301 DUDELANGE           H    F      7       189257.8  194757.8     SC        3533.8     37.5     A    060977
81402 AARHUS              H    B     08       196250.0  201750.0     VC        5026.0     29.5     A    060977
81404 SOENDERJYLLAND      H    B      7       189250.0  194750.0     SC        3526.0     29.4     A    060977
81503 BOKN                H    B      8       196247.4  201747.4     VC        5023.4     29.5     A    060977
81506 GAUSTA              H    B      8       196238.3  201738.3     VC        5014.3     39.8     A    060977
81508 HOVDEFJELL          H    B      7       189244.8  194744.8     SC        3520.8     29.3     A    060977
81509 JETTA               H    B      8       196250.0  201750.0     VC        5026.0     29.5     A    060977
81521 SOGNDAL             H    B      7       189257.8  194757.8     SC        3533.8     29.5     A    070977
81811 CASTROPODAME        V    B      7       189250.0  194750.0     SC        3526.0     29.4     A    060977
```

Fig. 4 - List of interfering transmitters (Bands I and III program)



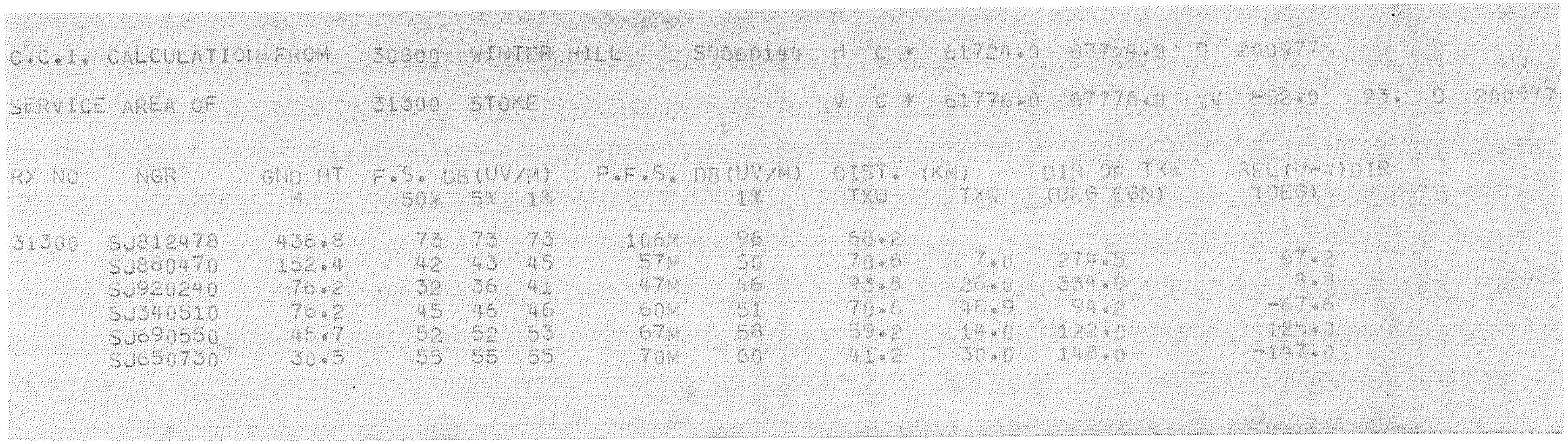
```
                          SITE OF SEDBURGH          NO. 70103

         N.G.R.      GND HT    AE HT      WANTED TX
                      (M)    A.G.L. (M)  DIST(KM)  DEG ETN  FS DB

       SD608880     211.8      30.5            .0        .0    ***

  INTERFERING TX.   F.S. DB(UV/M)    P.F.S. DB(UV/M) DIST. UNW        REL DIR
                     50%  5%  1%                1%      (KM)        (U-W)DEG
   WINDERMERE         46  46  46        86M    76       24.6              .0
   MOUNT LEINSTER      9  27  41        72     86      332.6              .0


                     DOMESTIC SITE OF SEDBURGH          NO. 70103

         N.G.R.      GND HT    AE HT      WANTED TX
                      (M)    A.G.L. (M)  DIST(KM)  DEG ETN  FS DB

       SD655920     137.2      10.1           6.5    229.3     78

  INTERFERING TX.   F.S. DB(UV/M)    P.F.S. DB(UV/M) DIST. UNW        REL DIR
                     50%  5%  1%                1%      (KM)        (U-W)DEG
   MOUNT LEINSTER      3  18  27        45     54      339.0             8.8


                     DOMESTIC SITE OF SEDBURGH          NO. 70103

         N.G.R.      GND HT    AE HT      WANTED TX
                      (M)    A.G.L. (M)  DIST(KM)  DEG ETN  FS DB

       SD625825      83.3      10.1           5.6    339.7     79

   NO SIGNIFICANT INTERFERENCE
```

Fig. 5(a) - Interference to a specified station (Bands I and III program)



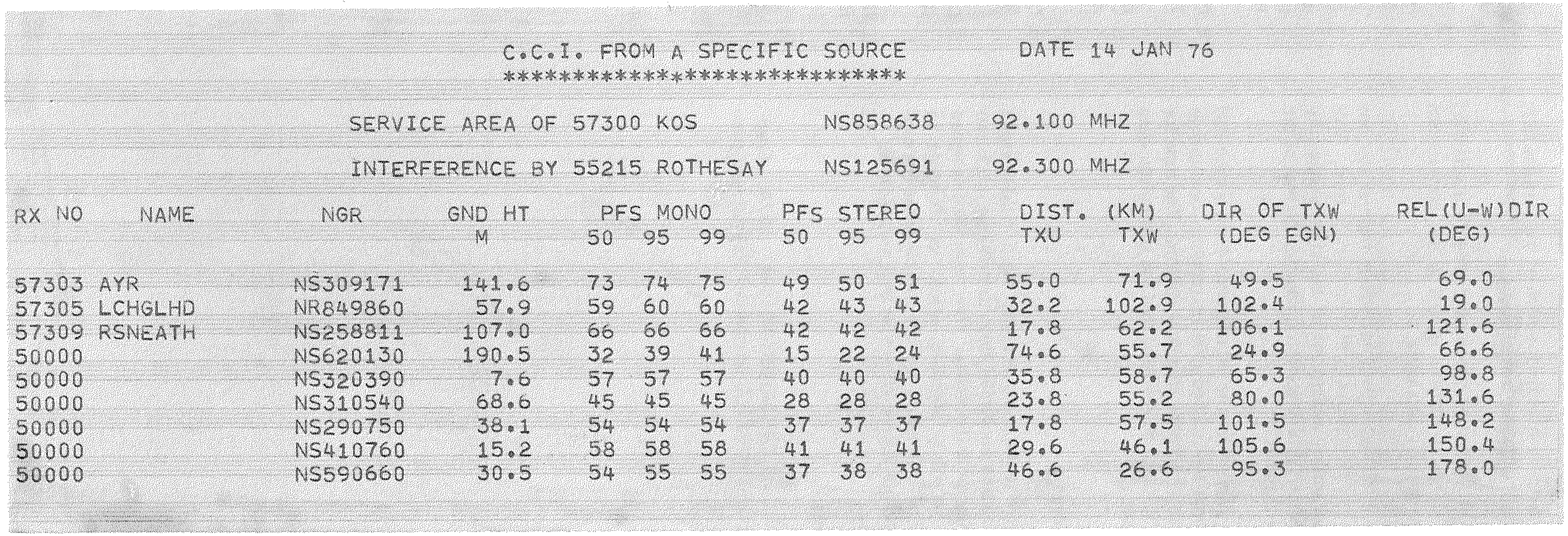
```
      SERVICE AREA OF AYR             TX.NO. 57303   88.700 MHZ     DATE 18 MAR 76
      ****************************************************************************



                          SITE OF AYR            NS 309171

                          GND HT  136.9(M)  AEHT  30.5(M)

NO SIGNIFICANT INTERFERENCE



                 DOMESTIC SITE OF AYR        88.700 MHZ

RX NO    NAME         N.G.R.    GND HT   AE HT     WANTED TX
                                  (M)     (M)     (KM)   DEG EGN    FS DB

50000                NS320390     7.6     10.0     22.2     183.5     41

INTERFERING TX.  FREQ.   DIST   REL DIR     FIELDS       PFS MONO     PFS STEREO
                                         50%  5%  1%   50% 95% 99%   50% 95% 99%


  PONTOP   G    88.500 A 201.4    -68.2   12  23  38    18  29  44    14  25  40
  BLNPLYF  G    88.700 A 364.0     -7.4   -1  10  16    35  38  44    44  47  53
  MELDRUM  G    88.700 A 240.8   -147.0    3  14  18    39  42  46    42  45  49

                                   MULTIPLE P.F.S.          44. 50.       49. 55.



                 DOMESTIC SITE OF AYR        88.700 MHZ

RX NO    NAME         N.G.R.    GND HT   AE HT     WANTED TX
                                  (M)     (M)     (KM)   DEG EGN    FS DB

50000                NS430270   106.7     10.0     15.9     230.5     39

INTERFERING TX.  FREQ.   DIST   REL DIR     FIELDS       PFS MONO     PFS STEREO
                                         50%  5%  1%   50% 95% 99%   50% 95% 99%


  PONTOP   G    88.500 A 186.4   -117.0   16  27  43    22  33  49    17  28  44
  BLNPLYF  G    88.700 A 351.4    -52.8   -1  10  15    35  38  43    44  47  52
  MELDRUM  G    88.700 A 244.4    162.2   10  21  26    46  49  54    49  52  57

                                   MULTIPLE P.F.S.          49. 55.       53. 58.
```

Fig. 5(b) - Interference to a specified station (Band II program)



```
C.C.I. CALCULATION FROM   30800  WINTER HILL     SD660144  H  C *  61724.0  67724.0  D  200977

SERVICE AREA OF           31300  STOKE                     V  C *  61776.0  67776.0  VV  -52.0   23.  D  200977

RX NO     NGR         GND HT  F.S. DB(UV/M)    P.F.S. DB(UV/M)  DIST. (KM)       DIR OF TXW      REL(U-W)DIR
                        M      50%  5%  1%                1%     TXU       TXW   (DEG EGN)         (DEG)

31300   SJ812478      436.8     73  73  73        106M    96     68.2
        SJ880470      152.4     42  43  45         57M    50     70.6      7.0   274.5              67.2
        SJ920240       76.2     32  36  41         47M    46     93.8     26.0   334.9               8.8
        SJ340510       76.2     45  46  46         60M    51     70.6     46.9    94.2             -67.6
        SJ690550       45.7     52  52  53         67M    58     59.2     14.0   122.0             125.0
        SJ650730       30.5     55  55  55         70M    60     41.2     30.0   148.0            -147.0
```

(a)



```
                              C.C.I. FROM A SPECIFIC SOURCE        DATE 14 JAN 76
                              *****************************

                         SERVICE AREA OF 57300 KOS          NS858638    92.100 MHZ

                         INTERFERENCE BY 55215 ROTHESAY     NS125691    92.300 MHZ

RX NO    NAME          NGR        GND HT     PFS MONO       PFS STEREO      DIST. (KM)      DIR OF TXW      REL(U-W)DIR
                                    M       50   95   99    50   95   99    TXU     TXW     (DEG EGN)         (DEG)

57303 AYR            NS309171     141.6     73   74   75    49   50   51    55.0    71.9     49.5             69.0
57305 LCHGLHD        NR849860      57.9     59   60   60    42   43   43    32.2   102.9    102.4             19.0
57309 RSNEATH        NS258811     107.0     66   66   66    42   42   42    17.8    62.2    106.1            121.6
50000                NS620130     190.5     32   39   41    15   22   24    74.6    55.7     24.9             66.6
50000                NS320390       7.6     57   57   57    40   40   40    35.8    58.7     65.3             98.8
50000                NS310540      68.6     45   45   45    28   28   28    23.8    55.2     80.0            131.6
50000                NS290750      38.1     54   54   54    37   37   37    17.8    57.5    101.5            148.2
50000                NS410760      15.2     58   58   58    41   41   41    29.6    46.1    105.6            150.4
50000                NS590660      30.5     54   55   55    37   38   38    46.6    26.6     95.3            178.0
```

(b)

Fig. 6

(*a*) Interference from a specified station (Bands I and III program) (*b*) Interference from a specified station (Band II program)

One of these outputs appears for each of the stations with which the specified station is interfering.

Version 4 computes the interference to a specified station, as 3 above, but with a special set of receivers not held on the transmitter data bank.

Version 5 calculates the interference from all stations in a network, for all stations in that network in turn. This gives a comprehensive assessment of the interference situation. The output of this version is identical to that of the first option of 3 above.

Version 6 predicts the interference from a specified station to a regularly spaced grid of receiver locations in the service area of another specified station. The data for both stations is input on cards, so that the transmitter data bank is not used.

8. Conclusions

It has been possible to produce v.h.f. field-strength prediction programs on similar lines to previous u.h.f. versions, but having more flexibility. They have been designed to meet various v.h.f. planning needs, for example to identify principal interfering sources and calculate the protected field-strength for receiving sites that are specified.

9. References

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